

FORM PTO-1390 (Modified)
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

A-7072

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)

09/581187

INTERNATIONAL APPLICATION NO.
PCT/AU98/01059INTERNATIONAL FILING DATE
18 December 1998 (18.12.98)PRIORITY DATE CLAIMED
18 December 1997 (18.12.97)

TITLE OF INVENTION

A FRAME UNIT FOR USE IN CONSTRUCTION FORMWORK

APPLICANT(S) FOR DO/EO/US

Peter BILOWOL

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Declaration/Power of Attorney (unsigned)

Verified Statement Claiming Small Entity Status (unsigned)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5) 09/581187		INTERNATIONAL APPLICATION NO. PCT/AU98/01059		ATTORNEY'S DOCKET NUMBER A-7072	
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21. The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :			CALCULATIONS PTO USE ONLY	
<input checked="" type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	\$970.00			
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	\$840.00			
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	\$690.00			
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)	\$670.00			
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)	\$96.00			
ENTER APPROPRIATE BASIC FEE AMOUNT =				
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				
		\$0.00		
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total claims	24 - 20 =	4	x \$18.00	\$72.00
Independent claims	3 - 3 =	0	x \$78.00	\$0.00
Multiple Dependent Claims (check if applicable).			<input checked="" type="checkbox"/>	\$260.00
TOTAL OF ABOVE CALCULATIONS =				\$1,302.00
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable).			<input checked="" type="checkbox"/>	\$651.00
SUBTOTAL =				\$651.00
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).			+	\$0.00
TOTAL NATIONAL FEE =				\$651.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).			<input type="checkbox"/>	\$0.00
TOTAL FEES ENCLOSED =				\$651.00
			Amount to be:	\$
			refunded	\$
			charged	\$

☒ A check in the amount of **\$651.00** to cover the above fees is enclosed.


☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **08-2455** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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 PATENT TRADEMARK OFFICE

Christopher J. McDonald

SIGNATURE

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NAME

41,533

REGISTRATION NUMBER

June 15, 2000

DATE

PTO/SB/09 (12-97)

Approved for use through 9/30/00. OMB 0651-0031

Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.**STATEMENT CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) & 1.27(b))—INDEPENDENT INVENTOR**Docket Number (Optional)
A-7072Applicant, Patentee, or Identifier: Peter BILOWOLApplication or Patent No.: 09/581,187Filed or Issued: June 16, 2000Title: A FRAME UNIT FOR USE IN CONSTRUCTION FORMWORK

As a below named inventor, I hereby state that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees to the Patent and Trademark Office described in:

- ☐ the specification filed herewith with title as listed above.
- ☒ the application identified above.
- ☐ the patent identified above.

I have not assigned, granted, conveyed, or licensed, and am under no obligation under contract or law to assign, grant, convey, or license, any rights in the invention to any person who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern, or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☒ No such person, concern, or organization exists.
- ☐ Each such person, concern, or organization is listed below.

Separate statements are required from each named person, concern, or organization having rights to the invention stating their status as small entities. (37 CFR 1.27)

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

Peter BILOWOL
NAME OF INVENTOR

Signature of inventor

Date
5th July 2000

NAME OF INVENTOR

Signature of inventor

Date

NAME OF INVENTOR

Signature of inventor

Date

09/581187

416 Rec'd PCT/PTO 16 JUN 2000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of:

Peter BILOWOL

Serial No:

Filed :

For : A FRAME UNIT FOR USE IN
CONSTRUCTION FORMWORK

PRELIMINARY AMENDMENT

Commissioner of Patents and Trademarks
Washington, DC 20231

Sir:

Prior to calculation of the filing fee, please amend
the application as follows:

In the Claims:


Claim 5, lines 1 and 2, change "any one of the
preceding claims" to --claim 1--.

Claim 13, lines 1 and 2, change "any one of the
preceding claims" to --claim 1--.

REMARKS

The above amendments are made to remove multiple
dependant claims to avoid the associated fee.

Respectfully submitted,

By 
Christopher J. McDonald, Reg. 41,533

June 16, 2000

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Attorney's Docket: A-7072.PAM/lat

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A FRAME UNIT FOR USE IN CONSTRUCTION FORMWORK

Field of the Invention

The present invention relates to the building industry.

5 Primarily the invention relates to building structures which are formed using concrete.

Background of the Invention

10 A typical method for constructing a building requires formwork to be provided in the shape of a wall and so as to allow concrete to be poured between the panels of the formwork and allow the concrete to set and thus form a wall.

15 As an example, formwork to construct a wall involves providing a number of rows of upright steel reinforcing rods which extend from a base support structure, connecting horizontal steel rods to the upright rods to form a channel between adjacent upright rods of each row and then connecting forming panel work such as plywood to the reinforcing rods so that side walls to the channel are provided and to enable concrete to be poured into the channel. When the concrete has set the formwork is removed thus providing a concrete wall.

20 Although the method described above for constructing a wall would appear to be relatively straight forward, complications arise in providing accurately dimensioned structures. Thus the width of a wall constructed using the above method can vary depending upon the accuracy of the location of reinforcing rods and panel formwork. In general all components required during construction of formwork must be accurately measured in order to achieve the desired dimensions of the finished structure.

25 In addition to the above whenever structures which include irregularities are required much care and attention must be taken in constructing the formwork for this applications. Thus a wall which requires a bevelled end face or curves or lintels generally increases the labour required in constructing the desired formwork.

35 The present invention provides an alternative to the

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conventional methods for constructing structures as described above.

Summary of the Invention

According to one aspect of the present invention
5 there is provided a frame unit for use in construction formwork comprising a plurality of frame components including first and second frame components and connection means for connecting frame components together to form an assembled frame; wherein a plurality of frame
10 units are arranged to be assembled to form formwork for a wall.

Preferably the frame unit includes reinforcing means for strengthening a wall formed using the frame unit.

The first frame component may comprise a first wall
15 section.

Preferably the second frame component comprises a second wall section.

Each frame component may comprise an elongate member.

20 Preferably each elongate member is configured to form a continuous loop of a predetermined shape.

The predetermined shape may be rectangular, square, triangular or any other shape required to form a structure.

25 Each elongate member may be configured to form a wall frame.

Each frame component may be assembled to form a unit having side and end walls.

30 Preferably the first frame component forms a side wall of the assembled frame.

The second frame component may form an end wall of the assembled frame.

Preferably the assembled unit comprises two first frame components and two second frame components.

35 Preferably the frame unit is in the form of a skeletal frame of a building block.

It is preferred that the reinforcing means includes a plurality of elongate elements.

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The frame components may be assembled with at least part of the reinforcing means extending therethrough.

The frame components may be assembled with the reinforcing means located between side wall frame components and extending upwardly and downwardly therebetween.

Preferably the reinforcing means comprises a plurality of metal grids.

It is preferred that the end wall frame components are arranged to abut with respective upright elongate elements of the reinforcing means.

According to one embodiment frame components of the frame unit are angled with respect to a vertical plane.

It is preferred that the connection means interconnects two frame components.

It is preferred that each elongate connection member
35 extends between adjacent corners of frame components.

It is preferred that the elongate connection members comprise horizontal rods which are arranged to run in

parallel with the top and bottom horizontal parts of the end frame components.

Preferably the elongate connection members are connected by clips to the corners of the frame unit.

5 The clips may be spring clips.

It is preferred that the ends of the elongate connection members extend beyond the corners of the frame unit.

10 The fastening means may include wire which is used to connect the elongate connection members to the frame unit. Alternatively the fastening means may be an adhesive or fibreglass or any other suitable means for fastening the elongate connection members to the frame unit.

15 According to one embodiment the frame unit is
assembled to form a cage.

According to another embodiment the elongate connection members have threaded ends which are arranged to receive threaded nuts.

20 The elongate connection members may include
removable retainers located at each end.

The elongate connection members may include spacers which are receivable thereon.

The elongate connection members may be arranged to
25 be connected to the mesh of the reinforcing means.

According to another embodiment the elongate connection members comprise round hollow plastic tubes through which a metal bolt can be placed.

According to another embodiment the frame unit
30 includes a plurality of panels adapted to be connected to
the assembled frame.

Each panel may have a predetermined shape.

Each panel may comprise openings for receipt of ends of the elongate connection members.

35 Preferably each panel comprises coupling means for
coupling adjacent panels together.

The panels preferably comprise openings through major faces thereof.

The coupling means may be male or female portions which are adapted to couple with matching male or female portions of another frame unit.

5 It is preferred that the male or female portions consist of holes and spigots, or alternatively channels and spigots.

The panels may form side walls of the frame unit.

10 Ends of the elongate connection members may be secured by attachment means such as nuts and clips to the panels.

At least one hole is provided through each panel and an attachment means is arranged to be located at the end of the elongate connection members to secure each panel to the frame unit.

15 Each coupling portion is preferably located on an edge face of the panel.

The panels may be plastic, plywood, steel or cardboard.

20 According to one embodiment the panels are made of cardboard and have flaps which are arranged to be connected to flaps of other panels in lieu of a coupling means.

It is preferred that the panels are removable and/or reusable.

25 The coupling means preferably provides rigidity to a plurality of assembled frame units.

It is preferred that spacers for the elongate connection members are used to separate the panels from adjacent frame components.

30 It is preferred that end portions of the reinforcing means extend into adjacent frame units so as to overlap end portions of reinforcing means of other frame units.

It is preferred that a plurality of reinforcing means are provided for each frame unit.

35 Where there is a plurality of reinforcing means it is preferred that these are arranged in a parallel layered arrangement.

According to another embodiment of the present

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invention there is provided a method of constructing formwork for a building structure comprising the steps of forming a frame unit by connecting a plurality of frame components together using a connection means to form an assembled frame with openings to allow for entry of a settable substance, providing a reinforcing means and connecting the reinforcing means to the frame unit and connecting panels to the frame unit to form a module which is movable to be connected to another module.

5
10 Preferably each module comprises coupling means for enabling modules to be coupled together.

It is preferred that the step of connecting the plurality of frame components together includes connecting elongate members across adjacent frame components.

15 The step of connecting the plurality of frame components together preferably includes providing a plurality of frame components of a predetermined shape and arranging the frame components to form a frame of a predetermined shaped.

20 It is preferred that the frame unit has a three dimensional shape.

Preferably each frame component comprises a loop of steel.

25 The frame component may be a hoop component.

The frame component may be annular.

It is preferred that the frame component comprises an elongate element configured to a predetermined shape.

30 According to another aspect of the present invention there is provided a panel having major faces and edge faces with openings through the major faces adapted to receive ends of elongate members and coupling means for coupling panels together.

It is preferred that the coupling means are located on the edge faces.

35 According to another aspect of the present invention there is provided a system for constructing a building structure including a plurality of modules each including

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a frame component.

Brief Description of the Drawings

A preferred embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Figure 1 shows a reinforced steel formwork frame according to a first embodiment of the present invention;

Figure 2 shows a reinforced steel formwork frame according to a second embodiment of the present invention;

Figure 3 shows the formwork frame of Figure 1 with panel support ties according to a first embodiment;

Figure 4A shows a front view of a panel support tie shown in Figure 3;

Figure 4B shows a tie with integrally formed clips;

Figure 4C shows a different type of clip and its implementation for connecting steel rods together.

Figure 5 shows a perspective view of a formwork frame with panel ties according to a second embodiment of the present invention;

Figure 6 shows one support tie according to the second embodiment connected to two frame elements;

Figure 7 shows two panels according to a first embodiment;

Figure 8 shows one of the panels shown in Figure 7;

Figure 9 shows a panel according to a second embodiment of the present invention;

Figure 10 shows a liner for the panel shown in Figure 9;

Figure 11 shows a schematic diagram of similar panels connected together;

Figure 12 shows male and female couplings for connecting panels together;

Figure 13 shows a finished module according to a first embodiment of the present invention;

Figure 14 shows an end elevation of a number of vertically stacked modules;

Figure 15 shows a section of wall according to a

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first embodiment;

Figure 16 shows a formwork frame for corner forms according to a first embodiment of the invention;

5 Figure 17 shows a formwork frame according to a third embodiment;

Figure 18 shows a formwork frame according to a fifth embodiment;

Figure 19 shows two panels connected together according to a second embodiment of the invention;

10 Figure 20 shows a support tie according to a third embodiment of the present invention;

Figure 21 shows a subframe assembly for a module according to a further embodiment of the present invention;

15 Figure 22 shows a top view of an alternative method for connecting corner modules together;

Figure 23 shows a screw in type support tie;

Figure 24 shows a corner tie according to a further embodiment of the present invention in top view;

20 Figure 25 shows a front view of a further embodiment of a corner tie according to the present invention;

Figure 26 shows a top view of a corner panel tie according to another embodiment of the present invention;

25 Figure 27 shows a top view of a corner tie according to a further embodiment of the present invention;

Figure 28 shows an end view of a clip according to another embodiment of the present invention;

30 Figure 29 shows a front sectional view of components of a support tie according to a further embodiment of the present invention;

Figure 30 shows a front view of a support tie according to another embodiment of the present invention;

Figure 31A shows a top view of a plate for a support tie according to one embodiment of the present invention;

35 Figure 31B shows a side view of a toothed tie for use with the plate shown in Figure 31A;

Figure 31C shows a toothed tie according to another embodiment of the present invention;

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Figure 33 shows an end view of a screw type tie according to the present invention;

Figure 35 shows an end view of another type of tie according to the present invention;

Figure 37A shows a front view of a panel according to a further embodiment of the present invention;

15 Figures 38A, 38B, 38C and 38D show different rib structures for panels according to the present invention;

Figure 40 shows another embodiment of a panel for a
20 module according to the present invention.

According to a preferred embodiment of the present invention formwork for building structures is simplified by making modules which can be connected together. A single module is made from a number of unique components.

As shown in Figure 1 a formwork frame 11 is constructed from a number of base elements which in this embodiment consist of two rectangular side wall frame elements 12, 13 and two rectangular end wall frame elements 14, 15. Each frame element is formed from a steel rod which is bent into a rectangular shape and welded at its end to form a continuous loop. A frame element could be formed by connecting together a number of straight steel rods to form a continuous loop. A steel reinforcement mesh 16 is provided and in this embodiment in a vertical orientation between the side wall frame elements 12 and 13 with three upright rods 17, 18, 19. The frame elements 12, 13, 14 and 15 are

assembled to form a box like frame structure with the reinforcing mesh 16 located with upright rods 17 and 19 in abutment with the end walls 14 and 15 and located approximately mid way between side framework elements 12, 13.

In the second embodiment of the invention shown in Figure 2 two reinforcement meshes 20, 21 are provided side by side and parallel to each other so that there is a small space between them. According to other embodiments of the invention additional reinforcement meshes may be provided and also reinforcements of a different configuration.

With the frame elements 12, 13, 14, 15 assembled as in Figure 1 they must be connected together to form a single box like frame 30. As shown in Figure 3 these components may be connected together using wire but it is preferred to use panel support ties 31 which as shown in Figure 4 consist of rod elements which are arranged to lie co-terminus with the horizontal sections of each of the end wall frame elements 14, 15. The ends of the support ties 31 are provided with a threaded section 32, 33.

Clips 34 are provided to connect the support ties to the adjacent horizontal walls 35, 36, 37, 38 of the end frame elements 14, 15.

The clips 34 may be any suitably designed clip which is able to connect two rod-like components together.

The support ties 31 also include spacer elements 39, 40 which enable a separation to be achieved between side frame elements 12, 13 and end wall elements 14, 15.

Figure 4 also shows how vertical sections 41, 42 of the side frame elements 12, 13 can be connected to the clips 34. The clips 34 may include two socket elements having resilient finger elements which are able to grip the vertical sections 41, 42 and the horizontal sections 35, 36, 37, 38.

If it is desired to used continuous steel inside the modules the panel support ties 31 may be provided with

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5 Each major face 64, 65 has four openings 68 provided
in a symmetrical pattern close to respective corners of
the panel 60, 61.

Each of the edge faces 66, 67 is provided with coupling portions 69 which in Figure 8 are shown as holes. As shown in Figure 11 however the edge faces are preferably provided with dowels in one edge face and correspondingly shaped holes in the opposing edge face. This enables adjacent panels to be connected together with the dowels of one panel connecting with the holes of an adjacent panel 73.

In an alternative embodiment shown in Figures 9 and 10 the panels may be made of a sheet of cardboard 79 with holes 80 provided in a similar configuration to the previous embodiment. A cardboard liner 81 is provided having a matching major face 83, but with peripheral rectangular flaps 84.

The panel 79 is stapled to the major face 83 of the liner 82 and the flaps 84 can be connected to flaps of

It is preferred that the panel 79 is stapled to the liner 83 and that flaps of adjacent panels are also stapled together.

Figure 13 shows how the ends of the reinforcement mesh 92 extend above, below and beyond the side walls of both the frame 95 and the panels 91.

According to another variation the middle units 101
25 can be offset inwardly with respect to the upper and
lower units 100, 102.

As shown in Figure 15 a wall may be assembled by having a series of modules connected together in a similar fashion to how bricks would be positioned in a wall. It should be noted however that where it is necessary to construct a corner or an end to the wall, modules of different shapes are required, thus a half module 111 is required in the lowermost section of the wall at one end thereof and a corner module 112 is required at the opposite end of the wall in the second layer. Thus as shown in Figure 16 a corner module is made from frame elements which are connected together to form a right angled block frame with panel support ties 113 being

connected across opposing side frame elements and in addition one support tie 114 being connected to the reinforcing mesh 115 which is opposite the side frame element near the outermost corner. Another support tie 5 16 connects to the support tie 115 from the other side of the corner.

According to a different embodiment of the present invention a corner tie is so designed as to hold the corners together securely as shown in Figure 22. Thus 10 panels 140 and 141 are connected at right angles to form an inner corner and panels 142, 143 are connected at right angles to form an outer corner.

Batons 144, 145 are located inside the inner corner panels 140, 141 and outside the outer panels 142, 143. 15 Each baton 144, 145 runs down the outer and inner corners secured by screws for additional strength. The inner panels 140, 141 may vary depending on the width of the wall.

The corner tie 146 connects outer panels 142, 143 20 and extends diagonally across the outside corner.

With such an arrangement walls can be formed at any particular angle with respect to each other with the batons providing reinforcement without the need for a cable tie to connect to inside reinforcing mesh.

As shown in Figure 17 a curved wall may be formed by 25 having one of the side frame elements 117 shorter than the other 118. Thus when adjacent modules are connected together one module will need to be angled with respect to the next so that the ends of each module abut.

A further embodiment of the invention shown in 30 Figure 18 includes panels 119 having a triangular configuration.

Other embodiments of the present invention are also covered by the invention and include panels which have 35 one, two or three holes and which thus may be one quarter, one half or three quarters of a standard module which is shown in Figure 13.

According to another embodiment of the present

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invention a module may be formed having a round shape so that the frame elements may be formed from a series of rings which are connected together using the aforementioned techniques. In such a case a curved panel would be required.

If it is desired to form a cavity an object of any suitable material is placed in between the panels of the module, steel ties of a suitable material are preferably provided in the object that forms the cavity. This therefore enables two concrete walls to be tied together that are formed from pouring inside the module.

Figure 19 shows an object 120 which may be polystyrene for example with steel ties 121, 122 extending transversely therethrough at upper and lower locations. Upper and lower panel support ties 123, 124 are shown having integrally formed clips as shown in Figure 4B.

The steel ties 121, 122 are preferably provided with lugs or clips 125 shown more clearly in Figure 20.

According to another embodiment of the invention a module may be formed using subframe assemblies as shown in Figure 21. Such a subframe assembly 130 which consists of a rectangular outer frame may be made of any suitable rigid material and can carry a lighter material such as cardboard or thin plastic. The frame 130 comprises a lattice 131 of metal rods, plastic rods or any other type of inner support for the frame 130. Furthermore, the lattice can be replaced by diagonally run supports or equivalent supporting structures.

Figures 4A, 4B and 4C showed different types of panel support ties used in forming individual modules. Set forth below are alternative types of support ties which may also be used.

In Figure 23 a screw-in type support tie is shown consisting of an inner rod 150 having peripheral reinforcing rod clips 151 aligned in rows with each row being displaced by 90° with respect to an adjacent row.

The outer ends of the rod 150 are provided with

Figure 26 shows corner panels tied together using a wedge key system in which the ends of the panels are

provided with wedged shaped key ways 170 and wedges are used to connect these panels together.

Figure 27 shows another key way system for corner panels in which the key ways 171 are straight. A key plate 172 is shown which is adapted to fit into the straight key ways 171 in combination with a threaded bolt or clip 173. Figure 28 shows one type of clip 173. This clip 173 actually clicks on and is U-shaped. The clip stops the panels or forms pushing out and separating vertically during concrete pouring.

The corner tie attachment described above is able to prevent movement in six different directions.

As shown in Figure 29 the support tie 174 has a ferrule 175, hold plate 176, tooth 177, rib 178, outer plate 179 and end screw 180.

The outer plate can be independent of this arrangement as shown in Figures 27 and 28.

The above type of support tie can be used along any part or place of the outside form.

A half version of these support ties can be produced for the bottom of the form when they are first arranged. In this embodiment the forms 182 rest on the support tie and the outer plates extend upwardly at each end as shown in Figure 30.

This bottom tie can be made in a single piece or can be adapted with a smaller screw. Alternatively it may be tied higher up where the initial form had its bottom ties.

It should be noted with the corner ties that the modules may be assembled on site instead of at the factory.

According to another embodiment of the invention ties can be produced with one thick side and the other side normal with an end screw. It should be noted that the hold plate is preferably rebated into the panel form.

If the support ties are moved out of the corner the rebate in the forms is filled with a tie having teeth 184 and corresponding opening 185 as shown in Figures 31a and

According to an alternative embodiment the support ties are provided with serrated teeth 183 protruding radially therefrom as shown in Figure 31C. The serrated teeth 183 provide better grip and can also be double-sided.

A further embodiment of the present invention includes strap ties. These ties as shown in Figure 32 do not screw off, instead they have to be cut off.

20 The rib 193 is clicked in position and a snap-on
piece slides over the ribs snap-in teeth. The rib in
addition to providing strength also acts as a spreader.

According to another variation of the present invention a keyed plate as shown in Figure 28 or a plate

with ribs either side of the tie can be slid down to engage two forms then a tie can be placed and turned to lock the forms together as shown in Figure 35, then when the top panels are due to be located in position it is ready to receive them in the slot provided by the legs of the U-shaped plate 200. Optionally there may also be provided a small ridge 201 which acts as a retainer to stop the tie being removed. Any other suitable means for preventing removal is also encompassed by the invention such as a cylindrical member located on the end of the tie and adapted to receive a screw which acts as the retainer.

According to another embodiment of the present invention socket ties are provided in which the panels are specially provided with recessed portions 202 as shown in Figure 36. These recessed portions 202 are adapted to receive a round knob 203 located at the end of each support tie 204. Other types of snap-in locking systems are also envisaged.

According to another variation of the present invention the ends of the support ties are insertable through holes in the modules and the ties are held in place by snap-on elements which are located on the other side of the modules.

Another type of tie envisaged by the present invention is a spool tie which has transverse portions located at each end which are adapted to fit into correspondingly shaped slots provided in the edge face of each module.

According to another variation of the invention a screw can be added through a window in the side of the module with a detachable spool being located at each end.

According to a further aspect of the present invention modules are provided with protrusions which allow a tie to be clipped thereon by a removal clip.

According to another variation of the present invention as shown in Figure 37 panels 205 or forms are provided with integrally formed clips 206 which slip

through an opening in a flange section of an adjacent form and clip into the other form, thus individual panels may be provided with interlocking components to allow them to be connected together. Alternatively they may be provided with male or female portions which are adapted to be connected together directly or through an intermediate removable member, thus modules may be provided with end flanges and slots which interlock and can be held in place by a wedge tie or dowelling strap.

The idea of using ribs was previously discussed in relation to Figure 29. Figures 38A, 38B, 38C and 38D show different configurations of ribbing which may be used to support the structure of a module. These include diagonal ribs extending between the corners of a module as shown in Figure 38B, a combination of diagonal ribs and a rectangular rib as shown in Figure 38A, a cross configuration of ribs as shown in Figure 38C which also incorporates diagonal ribbing in each window formed therein and finally a series of horizontal ribs with a single vertical rib as shown in Figure 38D.

According to one preferred aspect of the present invention a series of modules are able to be connected together so as to form any particular shape suitable for concrete pouring. According to an embodiment of the invention in which a universal type module is provided as shown in Figure 39, a module 210 is provided with peripheral slots 211 in upper and lower walls thereof. The size of the module can be selected as desired depending on the particular application of use.

The corners of the module are provided with cut-away sections 212 and the recessed portions 211 are spaced preferably at regular intervals along the upper and lower wall and if the height is large enough along the side wall as well.

Through holes 213 are provided through the centre of the module 210 and as shown in Figure 39 are arranged in pairs in axial alignment with opposing recesses 211 on the upper and lower edges of the module 210.

According to another variation of the present invention panels may be provided as shown in Figure 40. These panels have side walls provided with male portions 300 and female recesses 301. Each of the male portions 300 may be provided with a lateral hole therethrough. Adjacent panels may be connected together by interconnecting male and female portions 300, 301 and inserting a pin 302 through the coupled male and female portions.

The shape of the male and female portions may be changed and the method of interlocking the male and female portions may also be changed so as to include other locking means other than pins, for example expandable male portions may be provided to retain a male portion of another panel within a female portion located between two adjacent male portions.

CLAIMS

1. A frame unit for use in construction formwork comprising a plurality of frame components including a first frame component having a first wall section comprising at least one elongate member configured to form a loop, a second frame component having a second wall section comprising at least one elongate member configured to form a loop and a connection means for connecting frame components together to form an assembled frame with reinforcing means therethrough, which is adapted to have a plurality of panels connected thereto; wherein a plurality of frame units are arranged to be assembled to form formwork for a wall.
2. A frame unit as claimed in claim 1 wherein the reinforcing means comprises a mesh structure.
3. A frame unit as claimed in claim 1 wherein each frame component is assembled to form a rectangular unit having side and end walls.
4. A frame unit as claimed in claim 3 wherein the frame components are adapted to be assembled with the reinforcing means located between side wall frame components and extending upwardly and downwardly therebetween.
5. A frame unit as claimed in any one of the preceding claims wherein the connection means comprises an elongate connection member and at least one fastening means for connecting frame components thereto.
6. A frame unit as claimed in claim 5 wherein the connection means comprises a plurality of elongate connection members each adapted to be connected to a plurality of frame components with the fastening means.
7. A frame unit as claimed in claim 6 wherein each elongate connection member is adapted to extend between adjacent corners of frame components.
8. A frame unit as claimed in claim 7 wherein the elongate connection members comprise rods which are arranged to run in parallel with the top and bottom parts of end frame components.

9. A frame unit as claimed in claim 8 wherein the elongate connection members are adapted to be connected by clips to the corners of the frame unit.

5 10. A frame unit as claimed in claim 9 wherein the fastening means includes wire which is used to connect the elongate connection members to the frame unit.

11. A frame unit as claimed in claim 9 wherein the ends of the elongate connection members comprise removable retaining means for connection thereto.

10 12. A frame unit as claimed in claim 5, wherein each elongate connection member has at least one fastening means thereon.

13. A frame unit as claimed in any one of the preceding claims including a plurality of panels adapted to be connected to the assembled frames.

14. A frame unit as claimed in claim 13 wherein each panel includes openings for receipt of ends of the elongate connection members.

15 20 15. A frame unit as claimed in claim 14 wherein each panel includes coupling means for coupling adjacent panels together.

16. A frame unit as claimed in claim 15 wherein each panel is adapted to be connected to ends of the elongate connection members so as to be retainable thereon by retainers of the elongate connection members.

17. A frame unit as claimed in claim 16 wherein the elongate connection members have fastening means located on an outer surface thereof.

18. A method of constructing formwork for a building structure comprising the steps of forming a frame unit by connecting a plurality of frame components together using a connection means to form an assembled frame with openings to allow for entry of a settable substance, providing a reinforcing means through the assembled frame prior to assembly and connecting the reinforcing means to the frame unit and connecting panels to the frame unit to form a module which is movable to be connected to another module.

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19. A method of constructing formwork as claimed in claim 18 wherein each module comprises coupling means for enabling modules to be coupled together.

5 20. A method as claimed in claim 19 wherein the step of connecting the plurality of frame components together includes providing a plurality of frame components of a predetermined shape and arranging the frame components to form a frame of a predetermined shape.

10 21. A method as claimed in claim 20 wherein each frame unit has a three-dimensional shape and includes a plurality of loops connected together.

15 22. A panel for use in constructing framework for a building structure, the panel having major faces and edge faces with openings through the major faces adapted to receive ends of elongate members and coupling means for coupling panels together so that a reinforcing means is located between coupled panels.

20 23. A panel as claimed in claim 22 including coupling portions which are adapted to couple edge faces of adjacent panels together.

24. A frame unit as claimed in claim 1 wherein a plurality of elongate members are configured to form a loop of at least one of the wall sections.

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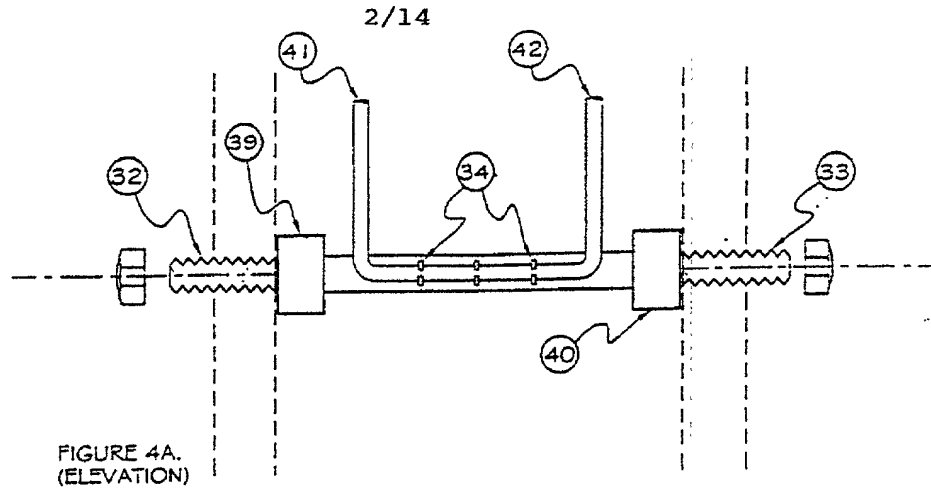
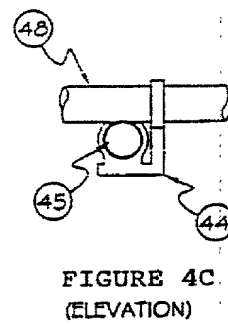
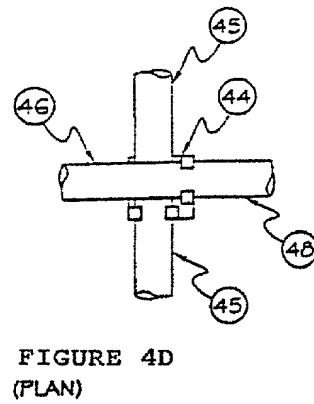
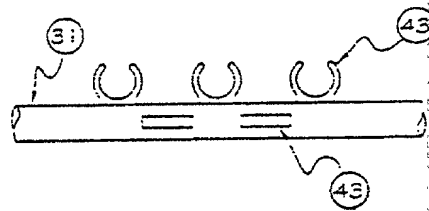
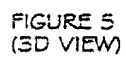
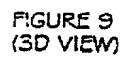


FIGURE 4B.
(ELEVATION)



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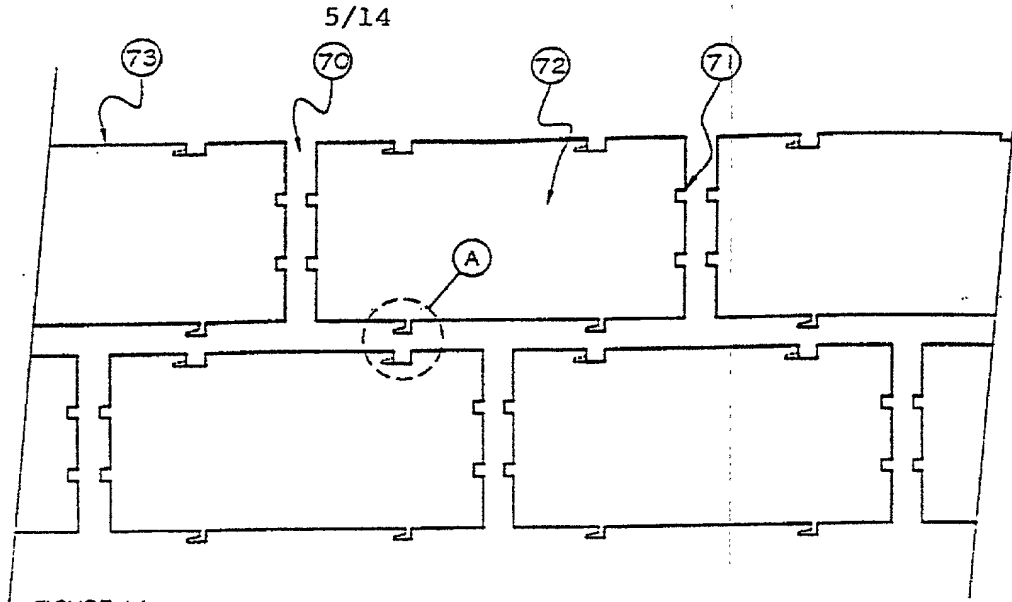


FIGURE 11
(ELEVATION)

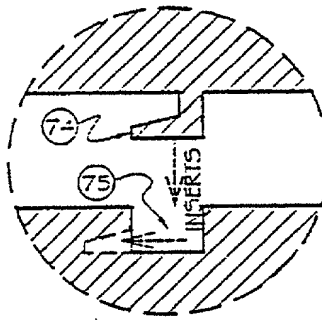


FIGURE 12 - DETAIL 'A'
(ELEVATION)

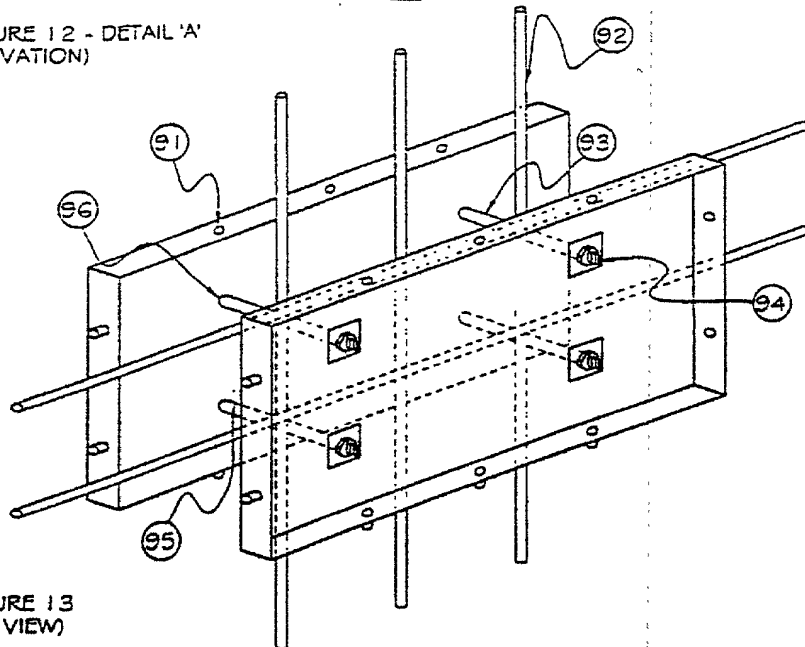
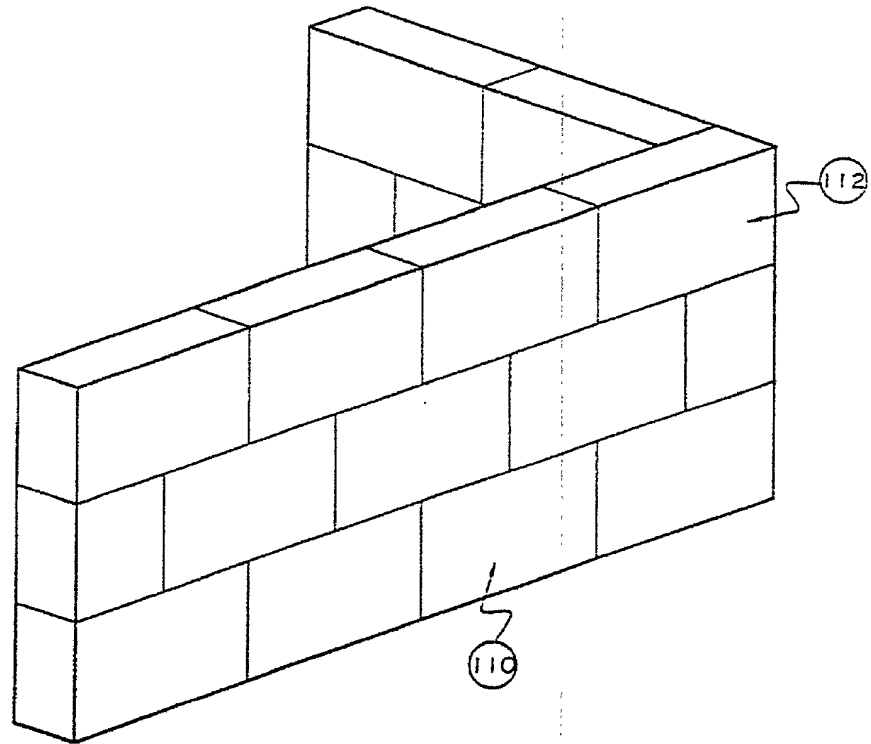
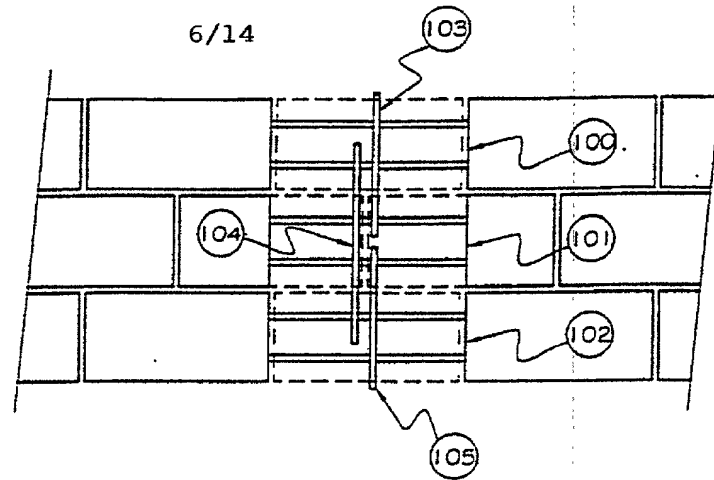


FIGURE 13
(3D VIEW)

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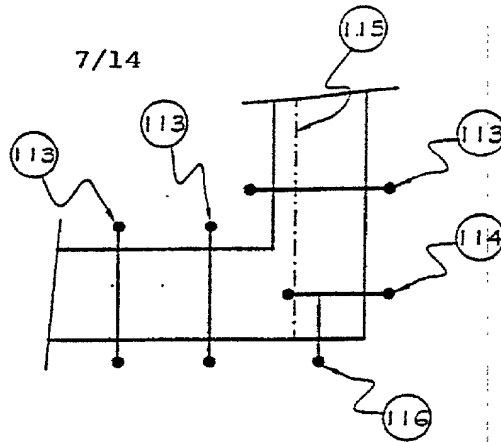


FIGURE 16
(PLAN)

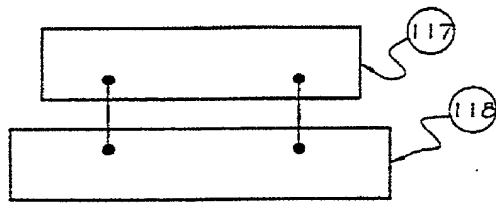


FIGURE 17
(PLAN)

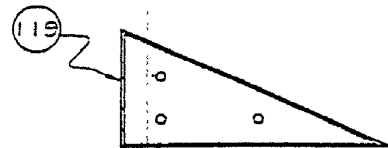


FIGURE 18
(ELEVATION)

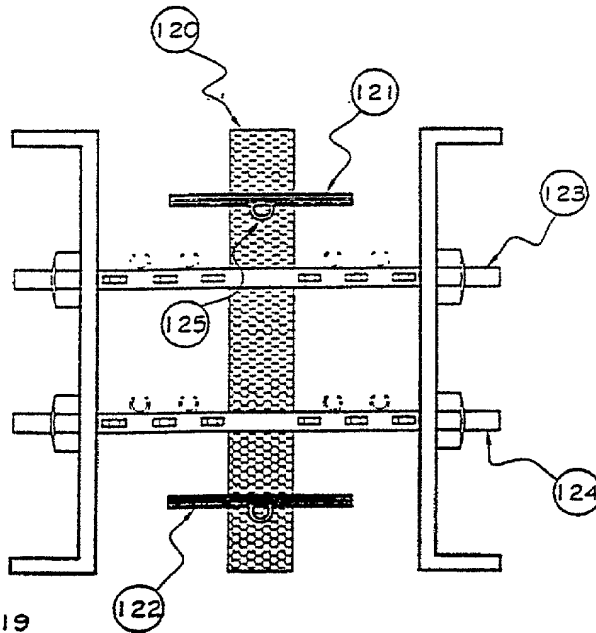


FIGURE 19
(PLAN)

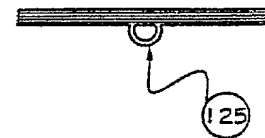


FIGURE 20
(PLAN)

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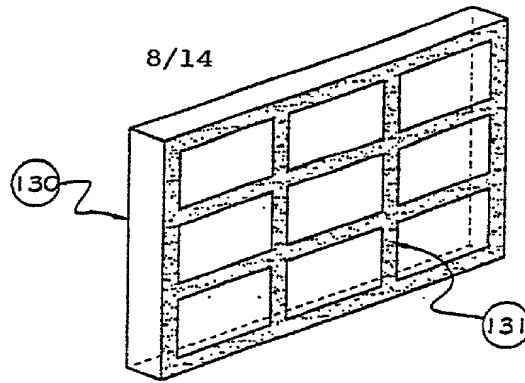


FIGURE 21
(3D VIEW)

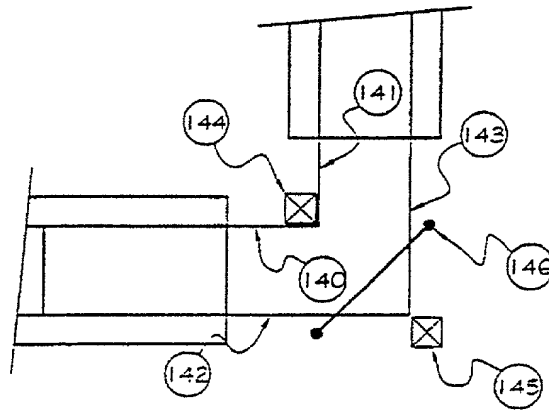


FIGURE 22
(PLAN)

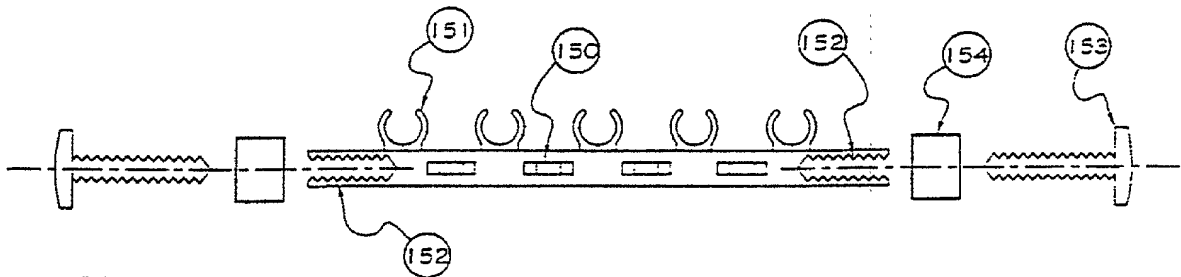


FIGURE 23
(ELEVATION)

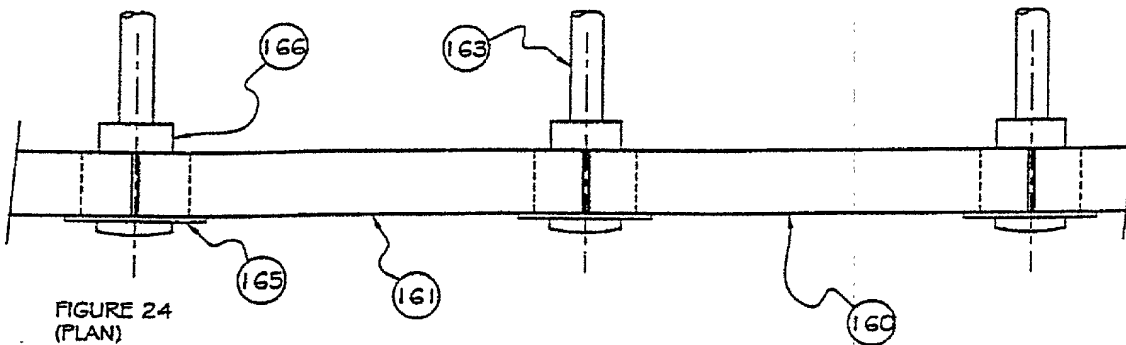


FIGURE 24
(PLAN)

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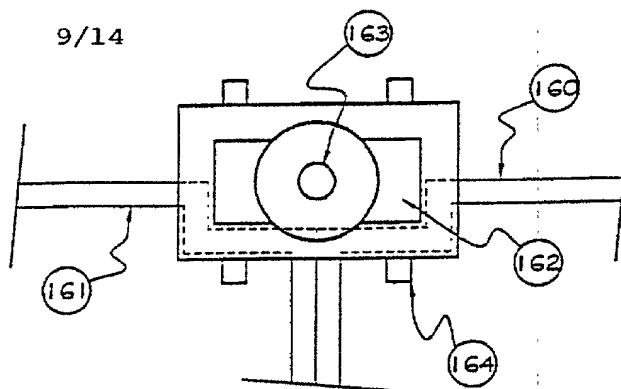


FIGURE 25
(ELEVATION)

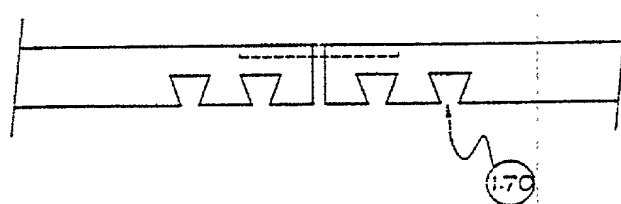
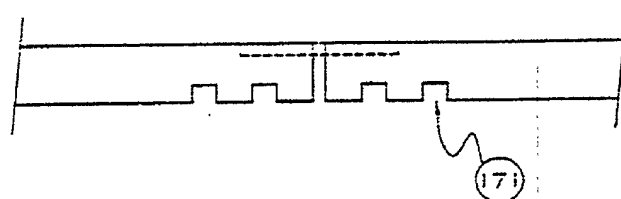
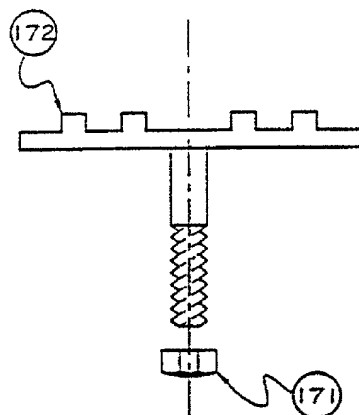
FIGURE 26A
(ELEVATION)FIGURE 26B
(ELEVATION)

FIGURE 27
(ELEVATION)

FIGURE-30
(SECTION)

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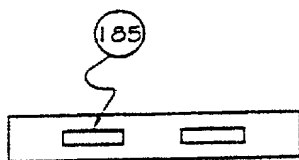


FIGURE 31A
(PLAN)

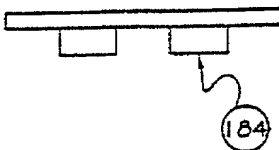


FIGURE 31B
(ELEVATION)

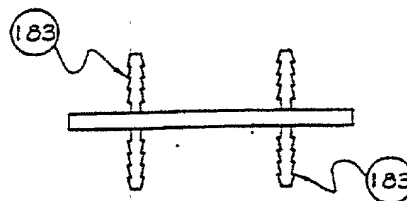


FIGURE 31C
(ELEVATION)

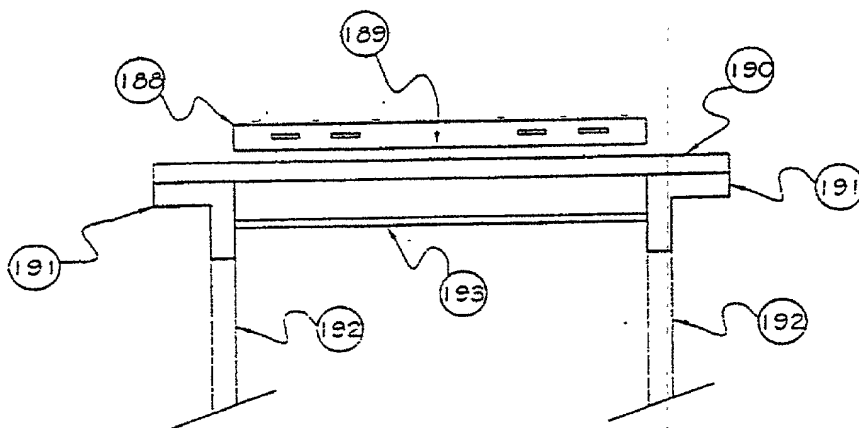


FIGURE 32
(SECTION)

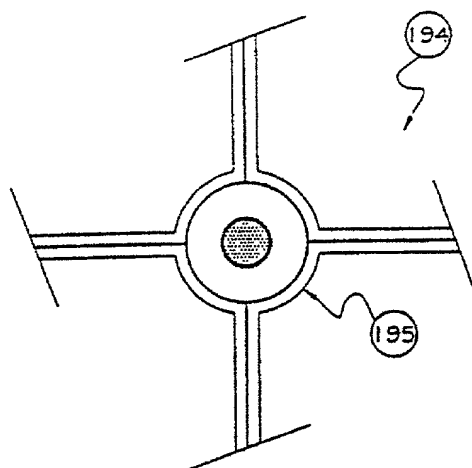


FIGURE 33
(ELEVATION)

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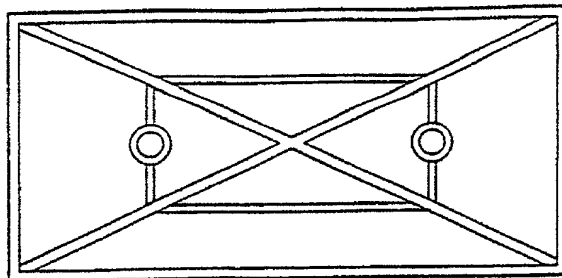


FIGURE 38A
(ELEVATION)

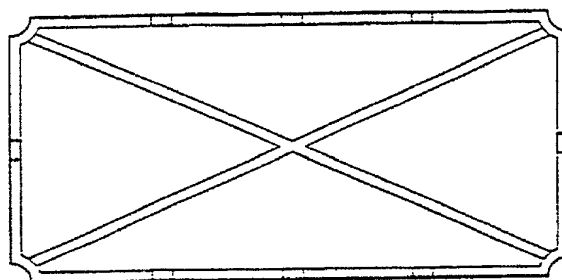


FIGURE 38B
(ELEVATION)

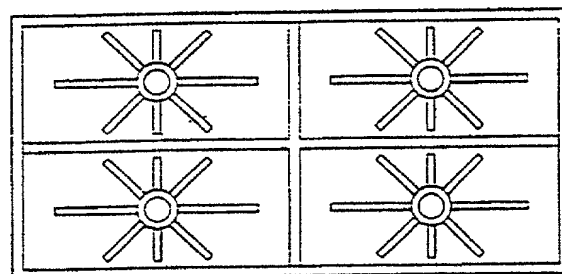


FIGURE 38C
(ELEVATION)

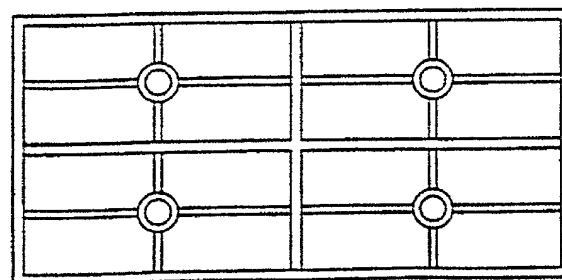


FIGURE 38D
(ELEVATION)

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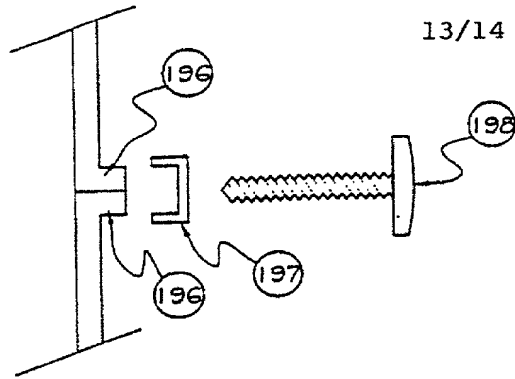


FIGURE 34
(SECTION)

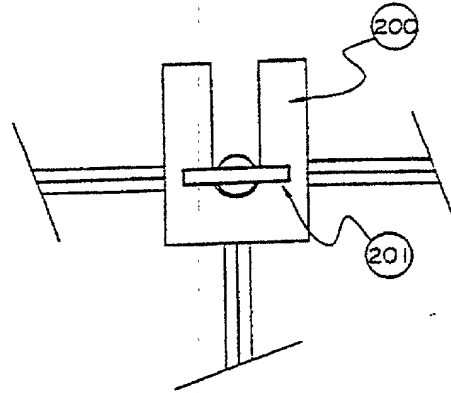


FIGURE 35
(ELEVATION)

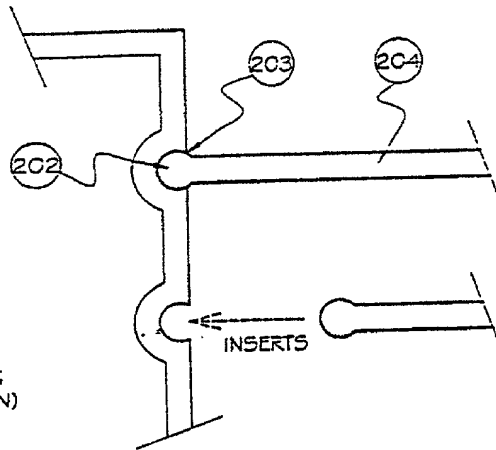


FIGURE 36
(ELEVATION)

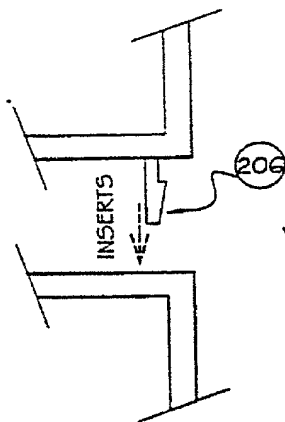


FIGURE 37.1
(SECTION)

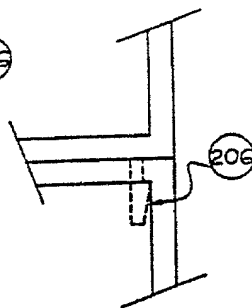


FIGURE 37.2
(SECTION)

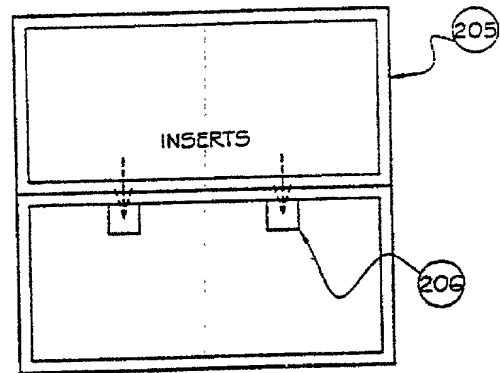


FIGURE 38
(ELEVATION)

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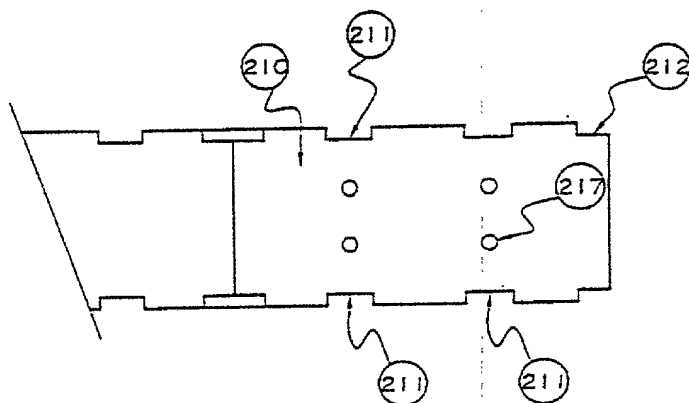


FIGURE 39
(ELEVATION)

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PTO/SB/01 (12-97)

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Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☒ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number A-7072

First Named Inventor Peter Bilowol

COMPLETE IF KNOWN

Application Number 09/581,187

Filing Date June 16, 2000

Group Art Unit

Examiner Name

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

A FRAME UNIT FOR USE IN CONSTRUCTION FORMWORK

the specification of which (Title of the Invention)

☐ is attached hereto OR☒ was filed on (MM/DD/YYYY) 12/18/98 as United States Application Number or PCT International

Application Number PCT/AU98/01059 and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
PP0967	Australia	12.18.1997	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])		Family Name or Surname	
Peter		BILOWOL	
Inventor's Signature	Date		5th July 2000
Residence: City	Nerang	State	Qld
Country	Australia	Citizenship	AU
Post Office Address	PO Box 546		
City	Nerang	State	Qld
ZIP	4211	Country	Australia

☐ Additional inventors are being named on the supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto